A NEW PYRANOXANTHONE AND FLAVONOIDS FROM *HYPERICUM CANARIENSIS*

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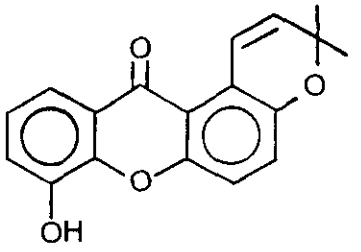
Abstract - *Hypericum canariensis* contains quercetin, hyperin, I3,II8-biapigenin and a new compound, hypericanarin B, which is identified as 8-hydroxy-3,3-dimethylpyrano[3,2-*a*]xanthen-12(3*H*)-one on the basis of spectroscopic evidence.

As a part of our chemical investigations of Spanish *Hypericum*[1-4] we previously reported several xanthones and xanthonolignoids from *H. canariensis* L.[3-4] Continuing our studies, we report here the isolation and characterization of a xanthone and three flavonoids of this plant. Among these compounds isolated, 8-hydroxy-3,3-dimethylpyrano 3,2-*a* xanthen-12(3*H*)-one (I), named hypericanarin B, has not previously been reported from natural sources.

The ethanol extract of the plant material was re-extracted with ethyl ether. Quercetin was removed by crystallization from this re-extract and the remaining residue was chromatographed on a silica gel column. This chromatographic separation afforded, in addition to small amount of several xanthones isolated from the chloroform extract,[3-4] quercetin and hyperin(quercetin-3-O-galactoside) a dimer flavonoid (II) and a new pyranoxanthone (I).

The least polar compound among eluted compounds was a new pyranoxanthone (I), which was identified on the basis of its spectroscopic properties. A xanthone nucleus was evident from the uv spectrum (264, 402 nm).[5] As the molecular formula determined by hrms was $C_{18}H_{14}O_3$, the molecular carbon content is compatible with a xanthone nucleus substituted with one C_5-unit. This group could be a 2,2-dimethyl-2*H*-pyran ring because the ^{1}H-nmr showed a pair of doublets at δ 8.10 and δ 5.91 (J = 10.0 Hz) as well as a six-proton singlet at δ1.44. The angular and adjacent position of this ring was clearly shown by the low-field nmr signal at δ 8.10 for one of the olefinic proton doublets, due to



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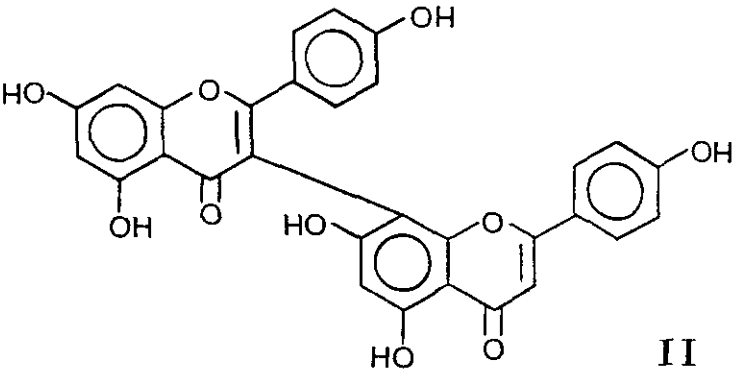

II

deshielding by the xanthone carbonyl group.[6-7] The angular position of the pyran ring was also shown by the absence of any uv absorption band in the region 280-290 nm, in contrast to those xanthones with a linearly cyclized pyran ring.[8-9] To complete the molecular formula of compound(I), one hydroxyl group was needed. The absence of an $AlCl_3$-induced shift in the uv spectrum of (I) and the absence of a strongly deshielded hydroxyl group in the ^1H-nmr spectrum of (I) indicated the absence of a chelated hydroxyl group in the 8-position.[10] Consequently, the hydroxyl group must be situated on C-5, because the aromatic region of the ^1H-nmr spectrum contains typical signals of three vicinal protons (H-6, H-7 and H-8) and an AB system (H-3 and H-4). Thus, the structure of hypericanarin B was established as 8-hydroxy-3,3-dimethylpyrano 3,2-a xanthen-12(3*H*)-one. It is interesting to note that hypericanarin B (I) is reported here for the first time and besides it has an oxygenation pattern that is infrequent in nature.[11-12] From *H. canariensis*[3] we previously isolated 2-hydroxy-5-methoxyxanthone and 2,5-dihydroxyxanthone, which have the same oxygenation pattern that hypericanarin B(I).

The second eluted product was identified as I3,II8-biapigenin (II) previously isolated from *Hypericum perforatum*[13] and *Hypericum aucheri*[14] by comparison of the spectroscopic properties. The last eluted compounds were quercetin and hyperin.

EXPERIMENTAL

Spectra were recorded with the following instruments: ms, Varian 160; nmr, Brucker AC-200(200.1 MHz for ^1H and 50.3 for ^{13}C) and uv, Perkin-Elmer Lambda 2.

Isolation.

H. canariensis was collected and classified as described previously.[3] The plant material (3.5 Kg) was extracted in a Soxhlet apparatus, successively with hexane, $CHCl_3$ and EtOH (20 l for 40 hours, each solvent). The EtOH extract was concentrated *in vacuo* to *ca.* 1 l, diluted with H_2O (2 l) and re-extracted with Et_2O (1 l). This re-extract was concentrated to *ca.* 100 ml and on standing gave quercetin(0.9 g). The remaining residue (72.5 g) was chromatographed on a silica gel column (60 cm x 6 cm I.D.) using mixtures of $CHCl_3$-MeOH as eluent. From fractions eluted with $CHCl_3$ and $CHCl_3$-MeOH (93:7) the compounds (I) (3 mg) and (II) (17 mg) were obtained by repeated column chromatography. Likewise quercetin (50 mg) and posteriorly hyperin (65 mg) were obtained from fractions eluted with $CHCl_3$-MeOH (9:1).

Hypericanarin B (I).

Non-crystalline. Ms m/z (rel.int.) 294 (M^+, 9.1), 275 ($M-CH_3$, 42.1),253 ($M-C_3H_5$, 2.4); uv λ_{max} nm: (MeOH) 263, 297, 322, 403; (MeOH+ NaOMe) 276, 366, 412; (MeOH+ NaOAc) 275, 366, 412; (MeOH+ $AlCl_3$): no change; (MeOH+ $AlCl_3$+ HCl): no change. ^1H-Nmr (acetone-d_6): δ 9.07 (s, HO), 8.10 (d, J= 10.0 Hz, Ar-C*H*=C), 7.67 (dd, J= 7.8 and 2.0 Hz, H-8), 7.42 (d, J= 9.4 Hz, H-4), 7.30 (dd,J= 8.0 and 2.0 Hz, H-6), 7.25 (d,J= 9.4 Hz, H-3), 7.22(t, J= 8.0 Hz, H-7), 5.91 (d, J= 10.0 Hz,Ar-C=C*H*) and 1.44 (s, 2xCH_3).

I3,II8-Biapigenin (II).

mp (methanol-chloroform) 259-261°C; ms (FI-CAI) m/z (rel. int.): 538 (100); uv λ_{max} nm : 271, 330; (MeOH+ NaOMe) 283, 330, 390; (MeOH+ NaOAc) 280, 380; (MeOH+ NaOAc+ H_3BO_3) 271, 330; (MeOH+ $AlCl_3$) 279, 352, 389; (MeOH+ $AlCl_3$+ HCl) 280, 345, 388. ^1H-Nmr (acetone-d_6): δ 7.65 (d, J= 8.6 Hz, II-H-2',6'), 7.46 (d, J=8.6 Hz, I-H-2',6'),6.85 (d, J=8.6 Hz, II-H-3',5'), 6.73(d, J= 8.6 Hz, I-H-3',5'), 6.57 (s, I-H-3), 6.54 (d, J= 1.5 Hz, I-H-8), 6.30 (s, I-H-6 and II-H-6).

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